

Nov. 5, 1940.

F. D. CHAPMAN

2,220,707

RECEPTACLE FILLING MACHINE

Filed July 31, 1939

2 Sheets-Sheet 1

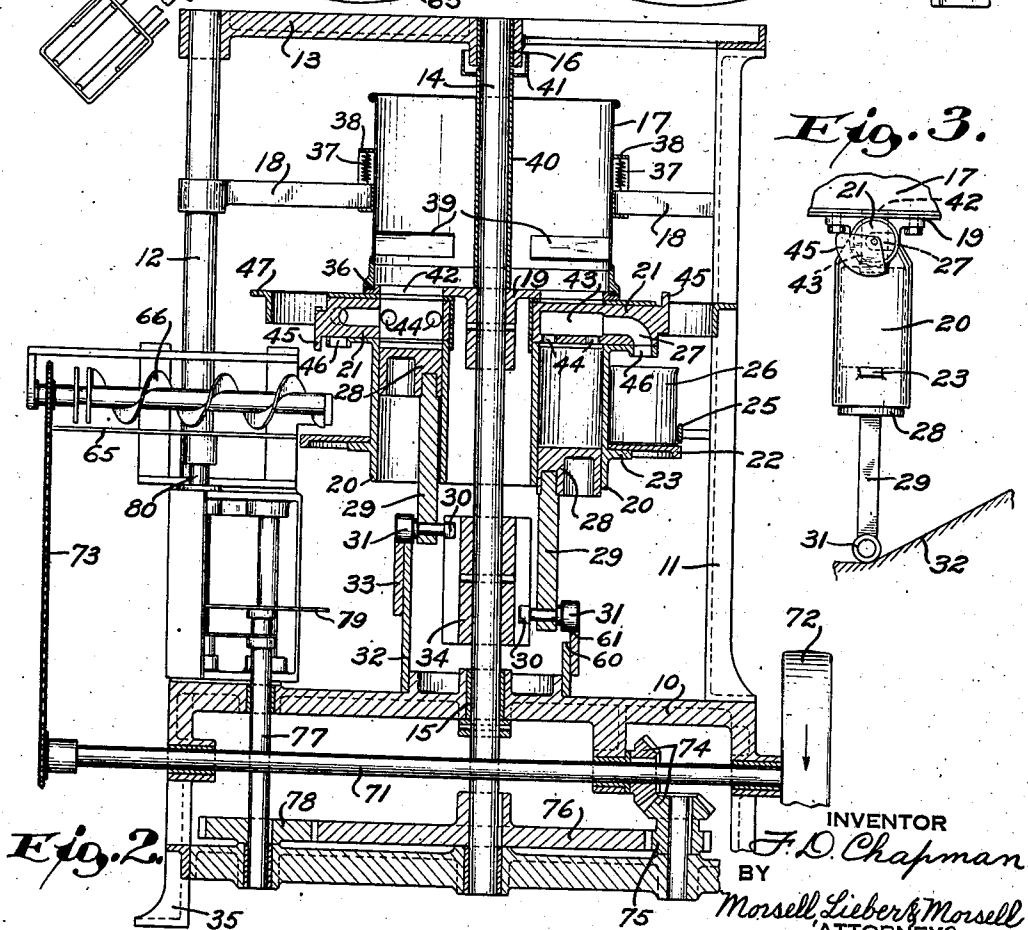
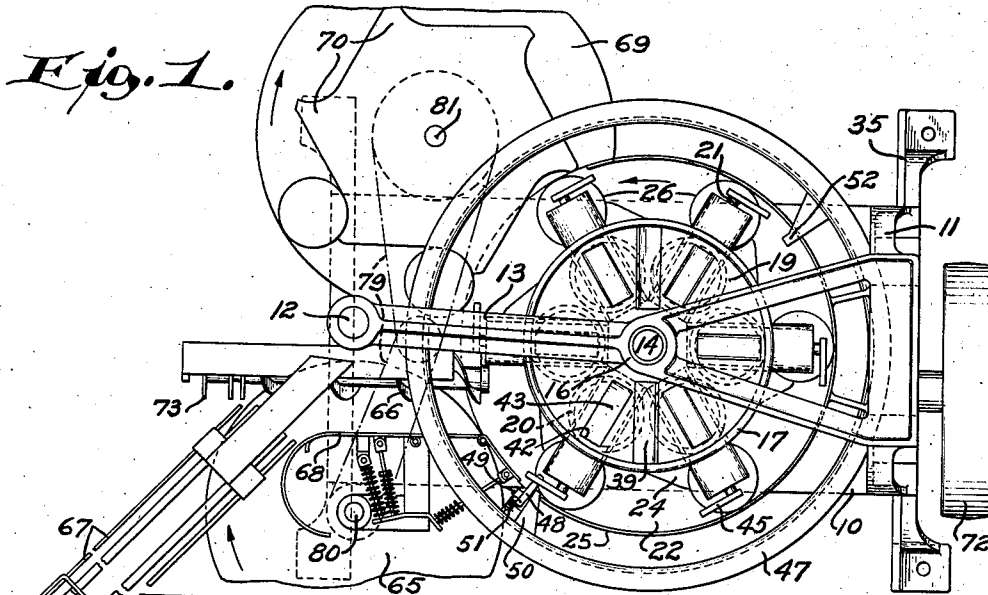
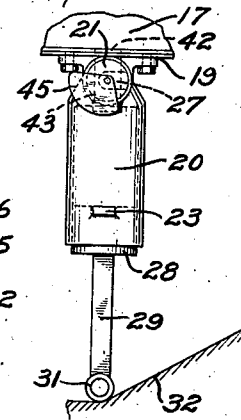


Fig. 3.



INVENTOR
F. D. Chapman
BY
Morsell, Lieber & Morsell
ATTORNEYS.

UNITED STATES PATENT OFFICE

2,220,707

RECEPTACLE FILLING MACHINE

Frank D. Chapman, Berlin, Wis.

Application July 31, 1939, Serial No. 287,590

10 Claims. (Cl. 226-97)

My present invention relates generally to improvements in the art of packaging fluent substances, and relates more specifically to improvements in the construction and operation of receptacle or can filling machines of the pressure type wherein successive batches of one kind of material are measured and delivered into the receptacles by the positive displacement action of plungers or pistons.

10 A primary object of the invention is to provide an improved pressure type of receptacle filler, which is simple in construction, reliable in operation, and wherein waste of material due to the absence of receptacles is entirely eliminated.

15 Some of the more specific objects of the invention are as follows:

To provide a compact and durable rotary filler for effectively handling semi-fluent substances such as corn, succotash, or the like.

20 To provide an automatic can filling machine wherein each of the successive receptacles is positively supplied with an accurately pre-measured charge of material, and in which the volume of the charges can be readily varied.

25 To provide an improved no-can-no-fill mechanism for automatic can filling machines, which is simple in construction and dependable in operation.

30 To provide a simplified rotary pressure filler, especially adapted to handle heavy fluent substances, and in which the measured batches are surged back into the supply tank when no receiving receptacles are available.

35 To provide a high speed can filling machine wherein the travel of the material is aided by centrifugal force, and in which the successive charges are accurately pre-measured.

40 To provide a sturdy can filling assemblage, all parts of which are readily accessible for inspection, adjustment and cleaning.

45 To provide various improvements in the details of construction of automatic can fillers, whereby the safety of operation thereof is enhanced, and the cost of manufacture and operation are minimized.

These and other specific objects and advantages of my present improvement will be apparent from the following detailed description.

50 A clear conception of the several features constituting my present invention, and of the mode of constructing and of operating automatic can filling machines embodying the improvements, may be had by referring to the drawings accompanying and forming a part of this specification

wherein like reference characters designate the same or similar parts in the various views.

Fig. 1 is a somewhat diagrammatic top view of one of my improved pressure fillers having six measuring pockets;

Fig. 2 is a central vertical section through the filler of Fig. 1, showing one of the displacement plungers up and another down, in extreme positions of travel;

Fig. 3 is a fragmentary outside view showing one of the charge measuring units of the machine;

Fig. 4 is a somewhat enlarged top view of the mechanism for adjusting the stroke of the measuring plungers;

Fig. 5 is a similarly enlarged side elevation of the plunger stroke adjusting mechanism, showing the movable cam ring in several positions of adjustment;

Fig. 6 is a fragmentary sectional view of the plunger stroke adjusting mechanism showing the manner in which this mechanism coacts with the plungers;

Fig. 7 is a fragmentary part sectional view of one of the measuring assemblages and its control valve, showing the action of the no-can-no-fill mechanism when no can is in position;

Fig. 8 is a similar fragmentary part sectional view of the measuring assemblage, showing the action of the non-can-no-fill mechanism when cans are in proper position; and

Fig. 9 is a top view of one of the measuring pocket assemblages and of the no-can-no-fill mechanism.

While the invention has been shown and described herein as being embodied in a continuously rotatable machine for automatically delivering pre-measured batches of fluent material such as corn to successive sanitary cans, it is not the intent to thereby unnecessarily restrict the scope or utility of the improvement.

Referring to the drawings, the improved receptacle filling machine which is shown more or less diagrammatically therein comprises in general a main frame having a base 10, uprights 11, 12 and an upper cross-beam 13; a central upright shaft 14 journaled for rotation in bearings 15, 16 carried by the base 10 and cross-beam 13 respectively; a stationary material supply tank or reservoir 17 surrounding the upper portion of the shaft 14 and being retained concentric with this shaft by arms 18 projecting inwardly from the uprights 11, 12; a constantly revolving disk-like member 19 carried by the shaft 14 and providing a bottom for the reservoir 17; a series of

six cylindrical measuring pockets 20 suspended from the rotary member 19 beneath the reservoir 17 and extending parallel to the axis of the shaft 14; an oscillatory control valve 21 interposed directly between the upper open end of each pocket 20 and the bottom of the reservoir 17; a revoluble receptacle or can support 22 carried by external flanges 23 on the pockets 20 and cooperating with can hooks 24 and with a fixed annular guide 25 to position successive cans 26 beneath the fluid discharge passages 27 of the several valves 21; a displacement piston or plunger 28 constantly reciprocable within each of the pockets 20 toward and away from the control valve 21 thereof, each plunger 28 having an actuating rod 29, a guide block 30 and an actuating roller 31; a pair of cooperating relatively adjustable inner and outer cam rings 32, 33 respectively, supported upon the base 10 and coacting with the rollers 31 to elevate the plungers 28; a guide element 34 carried by the shaft 14 and coacting with the guide blocks 30 to properly guide the plungers 28; mechanism for normally feeding empty cans 26 in succession to the machine; mechanism for normally delivering the filled cans 26 from the machine; and other mechanism for constantly actuating the shaft 14 and the can feed and discharge mechanisms.

The main frame may be of any suitable construction and the base 10 thereof may be provided with legs 35 of any desired height, and the upper cross-beam 13 is preferably readily removable so as to permit convenient assembly and removal of other parts. While the reservoir 17 in the present disclosure is stationary, the supply source may obviously be made rotatable with the main shaft 14 by merely attaching the outer reservoir wall to the member 19. However, when the fixed reservoir 17 is utilized, the lower end of the annular outer wall is preferably caused to coact with the plane annular upper surface of the rotary member 19, through a packing seal 36; and the reservoir 17 is urged downwardly into sealing engagement with the member 19 by helical tension springs 37 coacting with the arms 18 and with flanges 38 on the reservoir. The interior of the supply reservoir is provided with a series of inwardly projecting agitating vanes 39 which prevent bridging of the material. The portion of the upright shaft 14, within the reservoir 17 is preferably embraced by a sleeve 40 secured to the member 19 and extending above the normal material level, and a cup 41 secured to the sleeve 40 serves to prevent lubricant from the bearing 16 from entering the reservoir 17.

The revolving member 19 is provided with six radially disposed slots 42 which are communicable with transverse rectangular-sectioned through openings 43 formed in the oscillatory valves 21, and the valve openings 43 are directly communicable at their outer ends with the valve discharge passages 27. Transverse ports 44 are also formed in the valves 21; and each valve 21 is snugly confined within a bore in the member 19 or in a bracket rigidly attached to this member, and has an actuating crank or quadrant arm 45 secured to its outer end. The valve passages 27 are communicable with delivery ports 46 as shown at the right of Fig. 2, when the corresponding pocket 20 is in communication with the opening 43 through the ports 44; but when the opening 43 is in open communication with the adjacent slot 42, the passage 27 and the ports 44 are shut off as shown at the left of Fig. 2. Since the setting of the valves 21 is extremely

important, the cam levers are preferably surrounded by a guard ring 47.

The successive control valves are operable by means of an improved non-can-no-fill mechanism of simple construction which is shown in detail in Figs. 1, 7, 8 and 9. This mechanism comprises a lever 48 swingably suspended by a pivot 49 from a bracket 50 secured to the stationary guard ring 47 near the can inlet of the machine, and a spring 51 which normally urges the lever 48 into the position shown in Fig. 7. The lower end of the lever 48 is normally disposed in the path of travel of the cans 26, and is engageable with the successive cans to swing the lever 48 into the position shown in Figs. 8 and 9 wherein the upper offset end of the lever is in the path of advancement of the valve actuating quadrant arms 45. The revolving valves 21 will then be shifted by the lever 48 from the position of Fig. 7 to the position of Fig. 8 whenever a can 26 is in a position to receive a measured batch of material; but if no can is in place beneath the adjacent delivery port 46, the corresponding valve 21 and arm 45 will remain in the position shown in Fig. 7 with the pocket 20 in direct and open communication with the reservoir 17 through the opening 43 and slot 42. In order to return the successive valves 21 to the position shown in Fig. 7, an abutment 52 which is also rigidly attached to the stationary guard ring 47, is provided near the can delivery end of the filling zone, see Fig. 1. This abutment 52 extends into the path of travel of the quadrant arms 45 and automatically returns those valves 21 which were previously set to discharge position by the advancing cans 26 cooperating with the lever 48, to the position shown in Fig. 7 preparatory to measurement of subsequent charges.

As previously indicated, the displacement plungers 23 which are reciprocable within the cylindrical pockets 20, are movable upwardly by means of cam rings 32, 33 coacting with the rollers 31, and these plungers 28 may be moved downwardly by gravity, which may if desired be assisted by springs coacting with the rods 29. The inner cam ring 32 is rigidly attached to the base 10, and the outer cam ring 33 snugly embraces the inner ring and is adjustable vertically thereof by means of mechanism such as shown in detail in Figs. 4, 5 and 6, so as to vary the stroke of the plungers 28 and hence the volumes of the measured batches or charges of material. This adjusting mechanism comprises a pair of upright threaded rods 53 journaled in the base 10 and coacting with diametrically opposite ears 54 on the outer cam ring 33; and a horizontal worm shaft 55 journaled in bearings 56 and carrying worms 57 which mesh with worm wheels 58 secured to the lower ends of the rods 53. The shaft 55 is provided with a crank 59, and by turning this crank, the outer ring 33 may be moved vertically along the inner ring 32 either up or down to decrease or increase the plunger stroke. The worm gearing will obviously lock the cam ring 33 in any position of adjustment; and when this ring is in solid line position of Fig. 5 the plunger stroke will be longest, whereas adjustment of the ring 33 to the dot-and-dash line position of Fig. 5 will result in shortest plunger stroke. The cam rings 32, 33 are provided at their upper ends with cooperating annular roller engaging cam surfaces 60, 61, respectively; and both of these surfaces have locally depressed portions 62 adjoining each other, which causes the plungers 28 to move down-

wardly beyond final measuring position during each revolution of each plunger. This excess downward travel of each plunger 28 and subsequent return thereof to final measuring position, insures proper complete filling of each pocket 20 and also causes a slight surging action of the material through the valves 21 and into the reservoir 17. The inner cam ring 32 is provided with a plane upper portion 63, and the outer cam ring 33 is likewise provided with a plane lower portion 64; the former of which is located in the zone of action of the valve actuating abutment 52 while the latter is disposed in the zone of action of the valve actuating lever 48.

The mechanism for delivering the successive empty cans 26 to the filling machine, is preferably of the type claimed in my copending application Serial No. 189,490, filed February 9, 1938, and comprises a rotary horizontal can receiving disk 65 coacting with a revolving can feed screw 66 and with a fixed supply chute 67 and resilient guide 68, to deliver the successive cans 26 in front of the hooks 24 onto the revolving annular support 22 beneath and in alignment with the discharge ports 46. The mechanism for discharging the successive filled cans 26 from the machine, is of relatively well known construction and consists of a rotary horizontal discharge disk 69 and a revolving series of can hooks 70, both the can feed and discharge mechanisms being shown in Fig. 1. The mechanism for driving the various movable parts of the machine, is shown in Figs. 1 and 2, and comprises a horizontal drive shaft 71 journaled in the base 10 and having a driving pulley 72 at one end thereof; a chain drive 73 connecting the opposite end of the shaft 71 with the can feed screw 66; bevel gearing 74 associated with a medial portion of the shaft 71 and with a pinion 75 to rotate the latter; a gear 76 secured to the upright shaft 14 and meshing with the pinion 75 to impart rotation to the shaft 14; a counter shaft 77 journaled in the main frame and connected to the gear 76 by another pinion 78; and chain gearing 79 drivingly connecting the counter shaft 77 with the can feed and discharge mechanism driving shafts 80, 81. The assemblage is obviously such that when the shaft 71 is being rotated, the can feed and discharge mechanisms, as well as the measuring and filling mechanisms are being simultaneously operated to automatically deliver the successive empty cans 26 to the machine, to fill the cans with accurately pre-measured charges, and to deliver the loaded cans from the zone of filling.

While the normal operation of the improved receptacle filling machine should be apparent from the foregoing detailed description, it may be desirable to give a short résumé of this operation. When the machine is operating, the main drive shaft 71 is being rotated continuously to cause the can feed and discharge mechanisms to operate in unison with the measuring mechanism, and the stationary reservoir 17 should be supplied with an abundance of the bulk material. As the successive empty cans 26 are delivered upon the revolving support 22 by the feed screw 66, they are engaged by the can hooks 24 and are positioned beneath the delivery ports 46. The cans 26 are then carried in succession past the lever 48, and each time that a can is caused to engage this lever, the corresponding control valve 21 will be moved into the position shown at the right of Fig. 2 and in Fig. 8. The corresponding plunger 28 is then in its lowermost measuring po-

sition, having passed the depressed portion 62, and the adjacent valve 21 will be positioned to deliver material from the pocket 20 to the can 26 disposed below the corresponding port 46. As the plunger 28 is moved upwardly by virtue of the travel of its actuating roller 31 along the cam surfaces 60, 61, the measured batch of material within the cylindrical pocket 20 will be forced through the ports 44, opening 43, passage 27 and port 46 into the receptacle or can 26. The plunger 28 will continue to rise until its roller reaches the plane cam portion 63, whereupon the entire measured batch will have been delivered to the can 26, and the abutment 52 will become effective to shift the valves 21 in succession to the position shown at the left of Fig. 2 and in Fig. 7. After each valve 21 has been thus positioned, its corresponding plunger 28 will be lowered to draw a fresh charge of material from the reservoir 17 into the adjacent pocket 20 through the large opening 43, preparatory to subsequent filling of another receptacle or can 26.

If during continued revolution of the shaft 14, pockets 20 and plungers 28, no can 26 is delivered to any of the can hooks 24, the no-can-no-fill mechanism will function automatically. The lever 48 will then be retained in the position shown in Fig. 7 as the pocket 20 and plunger 28 to which no can has been supplied, passes the zone of the lever 48, and the corresponding valve 21 will remain in the position shown at the left of Fig. 2. As the plunger 28 is subsequently elevated, it will force the pre-measured charge of material back into the supply reservoir 17 through the opening 43 and slot 42, because the ports 44 and passage 27 will remain sealed. This return of the measured batch, besides preventing waste of material, also serves to agitate the semi-fluent material in the source of supply, and as soon as the supply of empty cans 26 is restored, the mechanism will automatically function to again deliver measured charges.

From the foregoing detailed description, it will be apparent that my present invention provides an improved receptacle filling machine which is extremely compact in construction, highly efficient in operation, and which avoids waste of material by virtue of the fact that no receptacles are being fed to the machine. When utilizing a stationary material supply reservoir 17 such as shown, it is preferable to provide an effective seal 36. The stroke of the plungers 28 may obviously be readily varied with the aid of mechanism such as shown in Figs. 4 and 5, so that the improved filling mechanism may be utilized in conjunction with various sized receptacles or cans 26. The provision of the recessed portion or depressed portion 62 on the cam rings 32, 33, insures proper filling of each measuring pocket 20, so that the finally delivered batches are of uniform volume. By positioning the cans 26 outwardly beyond the path of travel of the measuring pockets 20, and by locating these pockets as near to the axis of the shaft 14 as possible, the machine may be readily operated at relatively high speed without wasting material due to splashing, and the operation of the plungers 28 in conjunction with the vanes 39 located within the reservoir 17, retains the material in properly agitated condition and prevents bridging thereof across the slots 42. The entire mechanism may be readily assembled and dismantled and may also be readily inspected and cleaned. While the mechanism has been shown in relatively diagrammatic condition in order to avoid complications, it will be

obvious that all parts of the mechanism are of durable construction and may be readily machined and assembled.

It should be understood that it is not desired to limit this invention to the exact details of construction or to the precise mode of operation, herein shown and described, for various modifications within the scope of the claims may occur to persons skilled in the art.

I claim:

1. In a filler, a source of fluent material, a measuring pocket revolvable about an axis directly beneath said source, a plunger movable within said pocket during revolution thereof about said axis, a valve interposed directly between said pocket and said source and having a straight through passage for controlling delivery of said material from said source to said pocket and a port communicating laterally with said passage for controlling delivery of said material from said pocket to successive receptacles, means for advancing receptacles in succession about said axis with said pocket, and means for positioning said valve to cause said plunger to return measured batches of said material directly through said straight passage to said source when no receptacles are in position to receive the charges.

2. In a filler, a source of fluent material, a series of measuring pockets revolvable about a vertical axis directly beneath said source, a displacement plunger movable within each of said pockets during revolution thereof about said axis, a valve interposed vertically between each pocket and said source and having a straight through passage for controlling delivery of said material from said source to said pockets and a horizontal port communicating with said passage for controlling delivery of said material from said pockets to successive receptacles, means for advancing receptacles in succession about said axis with said pockets, and means for positioning said valves to cause the corresponding plungers to return measured batches of said material directly to said source through the straight passages of said valves when no receptacles are in position to receive the charges.

3. In a filler, a source of fluent material, a series of measuring pockets revolvable about a vertical axis directly beneath said source, a displacement plunger movable within each of said pockets during revolution thereof about said axis, a valve between each pocket and said source and having a straight through passage for controlling delivery of said material from said source to said pockets and a horizontal port communicating laterally with said passage for controlling delivery of said material from said pockets to successive receptacles, each of said valves being oscillatable about an approximately horizontal axis and said valves being disposed closely adjacent to and directly vertically between said source and said pockets, means for advancing receptacles in succession about said axis with said pockets, and means for positioning said valves to cause the corresponding plungers to return measured batches of said material directly to said source through the straight through passages of said valves when no receptacles are in position to receive the charges.

4. In a filler, a source of fluent material, a measuring pocket revolvable about an axis directly beneath said source, a plunger movable within said pocket during revolution thereof about said axis, a valve interposed directly between said pocket and said source and having a

straight through passage for controlling delivery of said material from said source to said pocket and a horizontal port communicating laterally with said passage for controlling delivery of said material from said pocket to successive receptacles, means for advancing receptacles in succession about said axis with said pocket, means for moving said plunger to first withdraw an excess amount of said material from said source and to return the excess vertically and directly to said source through said passage before delivery of a measured batch to a receptacle through said port, and means for positioning said valve to cause said plunger to return measured batches of said material directly through said passage to said source when no receptacles are in position to receive the charges.

5. In a filler, a source of fluent material having a central vertical axis, a measuring pocket revolvable closely adjacent to and about said axis directly beneath said source, a plunger constantly reciprocable within said pocket approximately parallel to said axis during revolution of the pocket about the axis, an oscillatory valve interposed directly between said source and said pocket, said valve being oscillatory about an approximately horizontal axis and having a passage extending directly therethrough for controlling delivery of said material from said source to said pocket and a port communicable laterally with said passage to control delivery of said material from said pocket to successive receptacles, means for revolving receptacles in succession about said vertical axis outwardly beyond the path of travel of said pocket, and means for positioning said valve to cause said constantly reciprocating plunger to return measured batches of the material directly to said source through said passage when no receptacles are in position to receive the charges.

6. In a filler, a source of fluent material having a central vertical axis, an annular series of measuring pockets revolvable closely adjacent to and about said axis directly beneath said source, a plunger constantly reciprocable within each of said pockets during revolution of said series about said axis, a valve interposed directly between said source and each of said pockets, said valves being rotatable about axes disposed approximately radial relative to said vertical axis and having passages extending directly therethrough for controlling delivery of said material from said source to said pockets and ports extending outwardly from said passages for controlling delivery of said material from said pockets to successive receptacles, means for revolving receptacles about said axis simultaneously with and outwardly beyond the path of travel of said pockets, and means for positioning said valves when no receptacles are present to receive the measured charges so that said constantly reciprocating plungers will return said charges directly through said passages to said source.

7. In a filler, a source of fluent material having a central vertical axis, a measuring pocket revolvable closely adjacent to and about said axis directly beneath said source, a plunger constantly reciprocable within said pocket approximately parallel to said axis during revolution of the pocket about the axis, means for varying the degree of reciprocation of said plunger, an oscillatory valve interposed directly between said source and said pocket, said valve being rotatable about an approximately horizontal axis and having a passage crossing its axis of rotation for con-

trolling delivery of said material from said source to said pocket and a port extending longitudinally of said axis for controlling delivery of said material from said pocket to successive receptacles, means for revolving receptacles in succession about said axis outwardly beyond the path of travel of said pocket, and means for positioning said valve to cause said constantly reciprocating plunger to return measured batches of the material directly through said valve passage to said source when no receptacles are in position to receive the charges.

8. In a filler, a source of fluent material having a central vertical axis, an annular series of measuring pockets revoluble closely adjacent to and about said axis directly beneath said source, a plunger constantly reciprocable within each of said pockets during revolution of said series about said axis, means for varying the limits of reciprocation of said plungers, a valve interposed directly between said source and each of said pockets, said valves being rotatable about approximately horizontal axes and each having a passage crossing its axis of rotation for controlling delivery of said material from said source to said pockets and a port extending longitudinally of its axis for controlling delivery of said material from said pockets to successive receptacles, means for revolving receptacles about said axis simultaneously with and outwardly beyond the path of travel of said pockets, and means for positioning said valves when no receptacles are present to receive the measured charges so that said constantly reciprocating plungers will return said charges directly through said passages to said source.

9. In a filler, a material supply reservoir having a central axis, a series of measuring pockets

revolvable about said axis beneath said reservoir, a plunger constantly reciprocable within each of said pockets during revolution thereof about said axis, a valve interposed directly between said reservoir and each of said pockets, said valves being oscillatable about approximately horizontal axes and having through passages formed to deliver material downwardly directly from said reservoir to said pockets and also having ports formed to discharge said material outwardly from said pockets to a zone beyond the path of travel of the pockets, means for positioning receptacles beneath the outer delivery openings of said valves, and means for returning measured charges upwardly directly from said pockets through said passages to said reservoir when no receptacles are thus positioned.

10. In a filler, a material supply reservoir having a central axis, a series of measuring pockets revoluble about said axis beneath said reservoir, a plunger constantly reciprocable within each of said pockets during revolution thereof about said axis, means for varying the stroke of said constantly reciprocating plungers, a valve interposed directly between said reservoir and each of said pockets, said valves being oscillatable about approximately horizontal axes and having through passages formed to deliver material downwardly directly from said reservoir to said pockets and also having ports formed to discharge said material outwardly from said pockets to a zone beyond the path of travel of the pockets, means for positioning receptacles beneath the outer delivery openings of said valves, and means for returning measured charges upwardly directly from said pockets through said passages to said reservoir when no receptacles are thus positioned.

FRANK D. CHAPMAN.